<u>IN THE SPECIFICATION</u>:

Please amend the Specification as follows:

Please amend the specification on page 1, between the title and the first paragraph by inserting the following new paragraph:

-- <u>CROSS-REFERENCE TO RELATED APPLICATION</u>

This application is a divisional application which claims the benefit of pending U.S. Patent Application No. 10/339,464, filed January 10, 2003, which in turn is a divisional application of parent Application No. 09/816,775, filed March 26, 2001, now U.S. Patent No. 6,632,143, issued October 14, 2003. The disclosures of the prior applications are hereby incorporated by reference herein in their entirety. --

Please amend the paragraph bridging pages 45 and 46 as follows:

The outer joint member 10 has three track grooves 12 axially extending in its inner periphery. Each of the track grooves 12 has roller guideways 14 formed on its circumferentially-opposed side walls. The tripod member 20 has three trunnions 22 which are projected radially. Each of the trunnions 22 carries a roller ~~34~~ $\underline{34_{co}}$, and this roller ~~34~~ $\underline{34_{co}}$ is accommodated in one of the track grooves 12 in the outer joint member 10. The outer peripheries of the rollers ~~34~~ $\underline{34_{co}}$ are convex surfaces conforming to the roller guideways 14. The tripod member 20 has a spline hole (or serration hole) 24 for accepting a spline shaft portion (or serration shaft portion) of the shaft to be coupled.

Please amend the first full paragraph on page 46 as follows:

The outer periphery of each roller ~~34~~ $\underline{34_{co}}$ forms a convex surface whose generator is an arc having the center of curvature radially off the axis of the trunnion 22. The roller guideways 14 have a section of Gothic-arch shape. Thus, the rollers ~~34~~ $\underline{34_{co}}$ and the roller guideways 14 make angular contact with each other. Spherical outer peripheries of the rollers may be combined with tapered cross sections of the roller guideways 14 to achieve angular contact therebetween. The adoption of such constitutions as provide angular contact between the outer peripheries 34a of the rollers ~~34~~ $\underline{34_{co}}$ and the roller guideways 14 makes the rollers ~~34~~ $\underline{34_{co}}$ less prone to vibrate, thereby stabilizing the orientation of the rollers. Incidentally, when the angular contact is not employed, the roller guideways 14 may be constituted, for example, by part of a cylindrical surface whose axis is parallel to that of the outer joint member 10. In this case, the cross-sectional shapes of the guideways 14 are arcs corresponding to the generator to the outer peripheries of the rollers ~~34~~ $\underline{34_{co}}$.

Please amend the paragraph bridging pages 46 and 47 as follows:

Rings 32 are fitted onto the outer peripheries of the trunnions 22. These rings 32 and the rollers ~~34~~ $\underline{34_{co}}$ are assembled (unitized) via a plurality of needle rollers 36 to constitute roller assemblies capable of relative rotations. More specifically, the needle rollers 36 are rotatably interposed between inner and outer raceway surfaces, with the cylindrical outer peripheries of the rings 32 and the cylindrical inner peripheries of the rollers ~~34~~ $\underline{34_{co}}$ as the inner and outer raceway surfaces, respectively. The needle rollers 36 are loaded in as many as possible without any retainer, or in a so-called full complement state. In this embodiment, collars ~~35~~ $\underline{35_{co}}$ for receiving the end faces of the needle rollers 36b are formed on one ends of the rollers ~~34~~ $\underline{34_{co}}$. The reference

numeral 33 represents washers which are fitted to annular grooves formed in the inner peripheries of the rollers ~~34~~ $\underline{34_{co}}$, with an aim to stop the needle rollers 36 from coming off. These washers 33 have a cut across their circumferences {see Fig. 11(B)}, so as to be fitted to the annular grooves in the inner peripheries of the rollers ~~34~~ $\underline{34_{co}}$ as elastically contracted in diameter. Incidentally, the collars ~~35~~ $\underline{35_{co}}$ may be eliminated so that both ends of the needle rollers ~~34~~ $\underline{36}$ are retained by pairs of washers 33.

Please amend the paragraph bridging pages 48 and 49 as follows:

As shown in Fig. 12, the generator to the inner peripheries of the rings 32 consists of a combination of an arc portion 32a at the center and relief portions 32b on both sides. The role of the relief portions 32b is to avoid the interference with the trunnions 22 at an operating angle θ as shown in Fig. 13(A). Each relief portion 32b is formed by a straight or curved line that gradually spreads out from an edge of the arc portion 32a to an end of the ring 32. The relief portions 32b illustrated here are formed by part of a conical surface having a vertex angle α = 50°. The arc portions 32a have a large radius of curvature on the order of e.g. 30 mm, so as to allow the trunnions 20 to tilt 2-3° or so with respect to the rings 32. Here, instead of being provided with the relief portions 32b as in this embodiment, the inner peripheries of the rings 32 may be formed into arcuate convex sections along their entire lengths. In either case, the above-described general elliptic cross sections of the trunnions 22 and the provision of predetermined clearances between the trunnions 22 and the rings 32 combine with each other to make the rings 32 movable along the axial directions of the trunnions 22 as well as capable of tilting movements with respect to the trunnions 22. Besides, as described above, the rings 32 and the rollers ~~34~~ $\underline{34_{co}}$ are unitized via the needle rollers

36 so as to be capable of relative rotations. Therefore, the rings 32 and rollers ~~34~~ $\underline{34_{co}}$ are capable of unitary tilting movements with respect to the trunnions 22. Here, the term "tilting movements" refers to the tilts the axes of the rings 32 and rollers ~~34~~ $\underline{34_{co}}$ make with respect to the axes of the trunnions 22, within the planes containing the axes of the trunnions 22 {see Fig. 13(A)}.

Please amend the paragraph bridging pages 49 and 50 as follows:

In the case of a conventional joint, the trunnions make contact with the inner peripheries of the rings at the full lengths of their outer peripheries. This produces circumferentially extended contacting ellipses. Therefore, when the trunnions tilt with respect to the outer joint member, there arise friction moments which function to tilt the rings, and finally the rollers, with the movement of the trunnions. On the other hand, in the embodiment shown in Fig. 10, the trunnions 22 have the generally elliptic cross sections and the inner peripheries of the rings 32 have the spherical cross sections. Thus, the contacting ellipses therebetween approach points as shown by the broken line in Fig. 12, with a reduction in area at the same time. As a result, the forces to tilt the roller assemblies ~~(32, 34, 36)~~ $\underline{(32,\ 34_{co},\ 36)}$ decrease greatly as compared to the conventional ones, whereby the rollers ~~34~~ $\underline{34_{co}}$ further improve in orientation stability. Moreover, in a conventional joint, the trunnions and the rings come to contact with each other at the width centers of the rings when the operating angle θ = 0. When the joint transfers torque with some operating angle, however, the trunnions oscillate axially, shifting the contacts between the trunnions and the rings to the lower than the width centers of the rings. This leads to unstable behavior of the needle rollers, sometimes hampering their stable rolling. In the embodiment shown in Fig. 10, on the contrary, the

contacts between the trunnions and the inner peripheries of the rings always stay at the width centers of the rings 32. Thus, the needle rollers 36 roll with stability.

Please amend the first full paragraph on page 51 as follows:

Conventional joints have collars for restraining roller tilts. These collars are formed on the bottom sides of the track grooves, i.e., on the sides of greater diameter as seen in the cross section of the outer joint member, so as to be opposed to the end faces of the rollers. The constant velocity universal joints according to the present invention may also have such collars. Nevertheless, in the embodiments described above, the factors to tilt the rollers ~~34~~ $\underline{34_{co}}$ are removed, or suppressed as much as possible. Accordingly, such collars in the track grooves 12 are not always required, and thus are omitted. This eliminates the fear that the rollers ~~34~~ $\underline{34_{co}}$ might come into contact with the collars to produce sliding frictions when they are temporarily swung by some reason.

Please amend the paragraph bridging pages 51 and 52 as follows:

Now, the dimensional proportion of the individual parts of the constant velocity universal joint according to the embodiment shown in Fig. 10 will be described with reference to Figs. 14(A) and 14(B). The following provides the description of the individual symbols in the diagrams.

S_{PCD}: the pitch circle diameter of the spline hole 24 in the tripod member 20,

H_T: the barrel width of the tripod member 20,

D_{JL}: the major diameter of a trunnion 22,

D_O: the outer diameter of the outer joint member 10,

T_{PCD}: the pitch circle diameter of the track grooves 12,

D_R: the outer diameter of a roller ~~34~~ 34_{co},

H_R: the with of a roller ~~34~~ 34_{co}, and

R_R: the radius of curvature of the outer periphery of a roller ~~34~~ 34_{co}.

Please amend the first full paragraph on page 52 as follows:

The pitch circle diameter T_{PCD} of the track grooves 12 in the outer joint member 10 is set so that its ratio to the pitch circle diameter S_{PCD} of the spline hole 24 in the tripod member 20, or T_{PCD}/S_{PCD}, falls within the range of 1.7-2.1, or preferably 1.72-2.10. The reason for this is that if the track grooves 12 are made so small in pitch circle diameter T_{PCD} that the ratio T_{PCD}/S_{PCD} falls below 1.72, there arises a problem of interference between the rollers ~~34~~ 34_{co} and the shoulders of the trunnions 22. Besides, the surface pressures at the contact portions, such as between the trunnions 22 and the rings 32, increase to cause a drop in durability. On the other hand, if the track grooves 12 are made so large in pitch circle diameter T_{PCD} that the ratio T_{PCD}/S_{PCD} exceeds 2.10, the outer joint member 10 increases in outer diameter D_O with a deterioration in vehicle mountability. In addition, if the outer diameter D_O of the outer joint member 10 is given, there remains little space for the roller assemblies (32, 34_{co}, 36) ~~(32, 34, 36)~~.

Before the first full paragraph on page 53, please insert the following:

Table 1

T_{PCD}/S_{PCD}	1.6	1.7	2.1	2.2
DURABILITY TEST RESULT	Δ	O	O	O
NEED OF INCREASE IN OUTER DIAMETER	NO	NO	NO	NEEDED

Please amend the paragraph bridging pages 54 and 55 as follows:

The outer diameter D_R of the rollers ~~34~~ $\underline{34_{co}}$ is set so that its ratio to the pitch circle diameter S_{PCD} of the spline hole 24, or D_R/S_{PCD}, falls within the range of 1.4-2.3, or preferably 1.47-2.21. If the rollers ~~34~~ $\underline{34_{co}}$ are made so small in outer diameter D_R that the ratio D_R/S_{PCD} falls below 1.47, the surface pressures between the rollers ~~34~~ $\underline{34_{co}}$ and the roller guideways 14 increase to drop the durability. Besides, the reduction in the thickness of the rollers ~~34~~ $\underline{34_{co}}$ causes a problem of deteriorated strength. Meanwhile, when the rollers ~~34~~ $\underline{34_{co}}$ are made so large in outer diameter D_R that the ratio D_R/S_{PCD} exceeds 2.21, the outer joint member 10 becomes thinner to drop in forgeability if the diameter D_O of the outer joint member 10 is given. This also produces a problem of shaft interference, as well as advances interference of the outer joint member 10 with the cup bottoms, yielding an increased cup depth and a greater weight.

Before the second full paragraph on page 55, please insert the following:

Table 2

D_R/S_{PCD}	1.3	1.4	2.05	2.21	2.33
DURABILITY TEST RESULT	Δ	O	O	O	O
CRACKS IN THINNER PORTIONS OF OUTER JOINT MEMBER	NONE	NONE	NONE	NONE	FOUND

Please amend the first full paragraph on page 56 as follows:

The barrel width H_T of the tripod member 20 is set so that its ratio to the pitch circle diameter S_{PCD} of the spline hole 24, or H_T/S_{PCD}, falls within the range of 0.81-1.22. If the tripod member 20 is made so small in barrel width H_T that the ratio H_T/S_{PCD} falls

below 0.81, the length of the spline fit decreases to lower the spline strength. On the other hand, if the tripod member 20 is made so large in barrel width H_T that the ratio H_T/S_{PCD} exceeds 1.22, there arises a problem of interference between the rollers ~~34~~ $\underline{34_{co}}$ and the shoulders of the trunnions 22.

Please amend the paragraph bridging pages 56 and 57 as follows:

The width H_R of the rollers ~~34~~ $\underline{34_{co}}$ is set so that its ratio to the pitch circle diameter S_{PCD} of the spline hole 24, or H_R/S_{PCD}, falls within the range of 0.38-0.67. If the rollers ~~34~~ $\underline{34_{co}}$ are made so small in width H_R that the ratio H_R/S_{PCD} falls below 0.38, the surface pressures between the rollers ~~34~~ $\underline{34_{co}}$ and the roller guideways 14 increase to drop the durability. Besides, the reduction in the rigidity of the rollers ~~34~~ $\underline{34_{co}}$ results in insufficient strength. Meanwhile, when the rollers ~~34~~ $\underline{34_{co}}$ are made so large in width H_R that the ratio H_R/S_{PCD} exceeds 0.67, the rollers ~~34~~ $\underline{34_{co}}$ come into interference with the shoulders of the trunnions 22. Moreover, if the outer diameter D_O of the outer joint member 10 is given, the outer joint member 10 becomes thinner to drop in forgeability.

Please amend the first full paragraph on page 57 as follows:

The radius of curvature R_R of the outer peripheries of the rollers ~~34~~ $\underline{34_{co}}$ is set so that its ratio to the pitch circle diameter S_{PCD} of the spline hole 24, or R_R/S_{PCD}, falls within the range of 0.19-1.11. If the outer peripheries of the rollers ~~34~~ $\underline{34_{co}}$ are made so small in the radius of curvature R_R that the ratio R_R/S_{PCD} falls below 0.19, the rollers ~~34~~ $\underline{34_{co}}$ drop in rigidity into insufficient strength. Meanwhile, when the outer peripheries of the rollers ~~34~~ $\underline{34_{co}}$ are made so large in the radius of curvature R_R that the ratio R_R/S_{PCD} exceeds 1.11, the outer joint member 10 becomes thinner to drop in forgeability if the diameter D_O of the outer joint member 10 is given.

Please amend the second full paragraph on page 59 as follows:

More specifically, as magnified in Fig. 20, a plurality of needle rollers 36 are rotatably interposed between inner and outer raceway surfaces, with the cylindrical outer peripheries of the support rings 32 and the cylindrical inner peripheries of the rollers 34 as the inner and outer raceway surfaces, respectively. Then, lock means are arranged on both axial sides of each roller assembly A so as to restrain axial relative movements of the support rings 32, the rollers 34, and the needle rollers 36. In the example shown in the diagram, the lock means on both sides consist of the lock rings ~~33 and 35~~ 33a and 35a, which are fitted to circumferential grooves 34c and 34d formed in the bore ends of the roller 34, respectively. There are slight axial clearances in between the lock rings ~~33, 35~~ 33a, 35a and the support ring 32, and in between the lock rings ~~33, 35~~ 33a, 35a and the needle rollers 36. The lock rings ~~33 and 35~~ 33a and 35a thus attached to the rollers 34 make contact with the end faces of the support rings 32 and the end faces of the needle rollers 36, thereby restraining these members from axial relative movements with respect to the rollers 34. Here, an example of the lock rings ~~33 and 35~~ 33a and 35a is a split ring partially split by a slit. As shown in Fig. 16(B), the needle rollers 36 are loaded in as many as possible without any retainer, or in a so-called full complement state.

Please amend the first full paragraph on page 60 as follows:

Alternatively, the roller assemblies A may adopt the structure shown in Fig. 21. In this example, one of the lock means in a roller assembly A consists of the lock ring ~~33~~ 33a, and the other consists of a lock collar 34e. The lock ring ~~33~~ 33a is attached by fitting to a circumferential groove 34c formed in one of the bore ends of the roller 34.

The lock collar 34e is arranged integrally on the other end of the roller 34. As compared with the structure shown in Fig. 20, there is an advantage that assembling tolerance due to the lock-ring constitution of the other lock means can be eliminated to reduce the axial clearances to the support ring 32 and the needle rollers 36 by half.

Please amend the paragraph bridging pages 62-63 of the Specification as follows:

The tilt suppressing means according to the sixth embodiment shown in Fig. 23 ~~are~~ is the establishment of coincidence between a center line L2 passing through the center of curvature of the outer periphery 34a of a roller 34 and a center line L1 passing through the center of curvature of the inner periphery 32c of a support ring 32 when the support ring 32 shifts ~~makes a~~ relative ~~shift to the trunnion bottom side with respect~~ to the roller 34 due to ~~clearances~~ a clearance between parts that constitute the roller assembly A, or as more clearly shown in ~~this example~~ the embodiment of Fig. 23, the axial ~~clearances~~ clearance Δc between the support ring 32 and the lock rings 33 and 35. This configuration can be realized, for example, by shifting the center line L1 of the support ring 32 Δh off the axial center (the axial center of the support ring 32) toward the trunnion bottom as shown in Fig. 22. This configuration reduces the inward component f. As a result, the tilts of the roller assembly A within the plane of the diagram (within the cross section perpendicular to the joint axis) are suppressed to ensure smooth rolling of the roller 34.